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ABSTRACT

This text, which focuses on coastal oil production, the countries and the people involved, is designed for use in upper elementary science, social studies, or math courses concerned with energy-related topics. The first half of the text is the Teacher's Guide. It presents an overview of the main ideas for each lesson, strategies for implementation, objectives, materials, and answer keys to student worksheets. The second half is the Student's Guide, including maps, graphs, worksheets, vocabulary, and articles to read. The unit introduces the methods by which oil is extracted from the Persian Gulf region and the Gulf of Mexico region. Transportation by super tankers, energy needs of the people of both regions, and oil production is discussed. A comparative approach to the people of each region stresses the diversity of cultures and is intended to expand children's views of culture. The interdependence of people and energy is emphasized. (SA)

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Interdisciplinary Student/Teacher Materials in Energy, the Environment, and the Economy

Two Energy Gulfs

Grades 6-7

March 1979

National Science Teachers Association

Prepared for
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March 1979
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Two Energy Gulfs

Introduction

Two Energy Gulfs is about energy and about the people who live in two regions of the world. It is a unit guided by two main principles. They are: (1) that energy use shapes and changes the way people live, and (2) that people depend on energy. Students expand their view of culture by making comparisons between the way they use energy and the way others use it. From case studies and by gathering information to complete a social profile, students begin to generalize a broader picture of two societies, and discuss their interdependence.

This unit, which is a comparative study of two world regions, focuses on the Persian Gulf region and the region of the Gulf of Mexico. The unit begins by having students examine the relatively shallow pockets along the shorelines which we call gulfs. Generally, it has been here in the gulf areas that oil geologists have found particularly rich deposits of oil and natural gas.

The second lesson moves to introducing the modern methods by which oil is extracted by either on-shore or off-shore wells, and transported to other world regions. Some of the risks involved in extracting and transporting oil are discussed. Additional lessons introduce students to quantitative studies--estimates of oil reserves, the vast amounts of oil transported by super tankers, and the numbers of barrels of oil used each day in the United States--and compares this number with the number of barrels of oil produced.

The final lesson points out the cultural diversity of the people who live in these two regions. It also discusses the similarities and differences among these and other regional societies.

Most of the lessons in this unit are designed for use in social studies and science classes at the upper elementary and junior high level. Two lessons are appropriate for math and science classes.

TABLE OF CONTENTS

	Title	Page	Target Audience
	Introduction	T 1 - 2	
1	What is an Energy Gulf?	T 5 - 11 51 - 55	Social Studies, Science
2	How Much Oil in the Two Gulfs?	T 13 - 18 56 - 60	Social Studies, Math
3	What Are the Risks and Dangers in Extracting and Transporting Oil?	T 19 - 29 61 - 74	Social Studies, Science
4	Super Size	T 31 - 37 75 - 80	Social Studies, Math
5	Two Worlds	T 39 - 43 81 - 92	Social Studies
	Unit Test	T 45 - 47 93 - 95	

T - Teacher Manual

Teacher Manual

To the Teacher

The purpose of the Teacher Manual is to help you use Two Energy Gulfs to best advantage when infusing energy-related topics into your Social Studies, Science or Math course. The Teacher Manual consists of two parts: (1) an introduction (see table of contents on the previous page), and (2) the main ideas, strategies, materials, and attainable goals for each classroom lesson (printed in light gray).

You will find the students' material printed on white stock behind this Teacher Manual. These exercises and activities can be easily duplicated into classroom sets. Complete student material for each lesson has been provided (see table of contents).

1. What is an Energy Gulf?

Overview

The world's known oil reserves are located in places where water once covered the land. Millions of years ago, ocean plant and animal life lived where present-day oil can be found. Through physical and chemical processes, these remains have been transformed into petroleum. This lesson introduces students to the processes of petroleum formation and to the fact that oil often migrates through cracks and porous rock and is formed some distance from the place where the marine organisms were deposited and subjected to high pressure and temperature.

Objectives

Students should be able to:

1. Discuss the locations of oil accumulations.
2. Find similarities and note differences in two regions on a map.

Target Audience

Social Studies, Science.

Time Allotment

One class period.

Materials

The following maps:

"The World As It Is Today," p 51
"The World 150 Million Years Ago," p 51
"World Ocean Current Patterns," p 52
"Major Oil Accumulations," p 53
"World Petroleum Producing Areas - 1977," and accompanying Student Worksheet, p 54

Student Worksheet, "Summing Up," p 55

Teaching Strategies

Ask the students if they have ever heard of Shell Oil. What does the sign look like? Why did the company choose to use a shell as a symbol? Why do you think another company uses the name Gulf Oil? Why "gulf"? Point out that this lesson has something to do with gulfs and the ocean. They are to think of these things as the lesson continues. At the end, ask the students to find the links between these words and what they have learned.

Turn the class' attention to a world map or a large globe. Tell them that they are going to study two regions of the world that have some things in common and some differences. Point to the Gulf of Mexico on the map. Ask a volunteer to name the region. Then point to the Persian Gulf region and ask someone to name this place. Have students put these place names in their notebooks. Then ask if the word "gulf" has begun to have meaning.

Note: At this point, you may wish to define the term "gulf" instead of waiting for the students to form their own working definition. Discuss other, related terms such as "bay," "fjord," and "inlet."

Developing the Lesson

Distribute copies of the map activity for this lesson and ask the students what they think they will learn from the maps. How are the maps alike? How are they different?

Map 1

Have students label the numbered continents on Map 1.

Map 2

Next, turn the students' attention to the map of the world as it may have existed 150 million years ago. You may want to introduce this map by saying that scientists believe that forces capable of moving whole continents operate within the earth; that the map of the world did not always look as it does today; that the earth's surface is dynamic, divided into pieces (sometimes called plates) floating on a more viscous inner mantle. Continents riding on these plates have drifted away. Sometimes they joined other continents and split from others in many ways, each time changing their outlines.

The continents are still drifting. The Pacific Ocean is getting smaller each year, and the Atlantic Ocean is slowly growing wider; so slowly, however, that it can hardly be measured. Ask students if they think the changing patterns in land masses have affected the wind and the ocean currents.

Map 3

Winds and the seas move in set patterns. Animal and plant life tend to flow with these currents. Eventually animal and plant life settle along the coasts in places where the ocean currents swerve in along the coastline. Small plant life and animals will settle at these points in greater quantities, will die there, and will pile up in deep layers. Have students mark those places on the map where scientists think the greatest concentration of aquatic fossils can be found.

Before the students mark the places on the map where they think plant and animal life might settle in large quantities, review the fact that the seas are never still; they flow in general directions called currents. These currents are influenced by wind patterns, temperature and land forms.

Discuss where and why these animal and plant life deposits are located in gulf areas and that the areas of greatest settlement by plankton would most likely be where ocean currents pound at the shore, and where the shoreline is somewhat protected.

Introduce oil formation in these gulf areas by mentioning that scientists now believe that great oceans covered large parts of the world's surface millions of years ago. As tiny plants and animals in the oceans died, their remains settled on the muddy bottoms. Then bacteria caused them to decay. More mud and sand covered the decayed plant and animal matter. Mud and sand are called "sediments." As sediment builds up, pressure from the enormous weight caused the mud and sand to form sedimentary rocks called shale and sandstone.

During this process pressure and heat caused molecules in the plants and animals to change into petroleum. The heat drove the oil out of these rocks and into other layers of sedimentary rocks and sealed the oil in underground reservoirs.

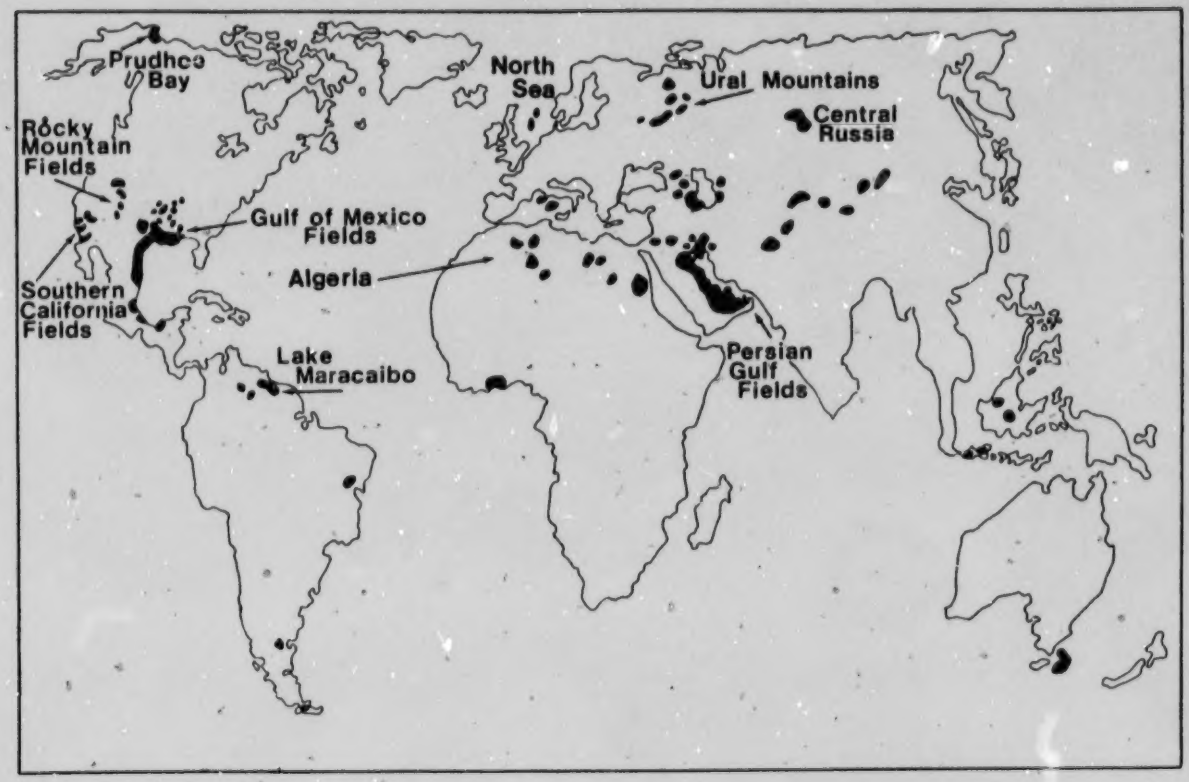
Map 4 This map should show your students where these concentrations are located today.

Help students located and names these areas, and answer each question.

(Answers are on teacher map, next page.)

Map 4

Major Oil Accumulations



The map above shows where major oil accumulations exist. Have students name these places. Put the letters GM where they see the Gulf of Mexico; LM for Lake Maracaibo (Venezuela); AL, Algeria and Libya; PG, Persian Gulf; NS, North Sea; PB, Prudhoe Bay (Alaska). Have students name the other places as well.

Tell students to use an atlas to check their answers.

Lesson 1
Student Worksheet:

World Petroleum Producing Areas - 1977

Answer the following:

1. What energy source is shown on the map?
   (Petroleum/oil.)

2. What is another word for petroleum?
   (Oil.)

3. The map shows many large oil producing areas. Which are the two largest?
   (Gulf of Mexico; Persian Gulf.)

4. What word is used in both of these large oil fields?
   (Gulf.)

5. Look carefully at the map. How would you describe a gulf?
   (A part of the ocean or sea extending into the land.)

6. What is an energy gulf?
   (A part of the ocean extending into the land and containing large deposits of oil and gas.)

Lesson 1
Student Worksheet: Summing Up

Answer each question below in a full sentence.

1. What is a continent?
   (A continent is a large land mass.)

2. What are the names of the world continents?
   (The continents are named: North America, South America, Eurasia, Australia, Africa, and Antartica.)

3. What did the world's land look like 150 million years ago?
   (Millions of years ago the continents were pushed much closer together.)

4. What did ancient ocean currents have to do with today's oil deposits?
   (The general movement of the waters made ancient plant and animal life collect and settle in coastal waters, making these areas particularly rich in today's oil and gas.)

5. What things would you look at, if you had the job of finding oil?
   (I would look at what the currents in the ancient oceans might have been, where the gulfs were, what the geologic formations are now.)

2. How Much Oil in the Two Gulfs?

Overview

In this lesson students look at how much oil there is in the two gulf areas, at the rate oil is produced, at estimates of oil remaining, and at current estimates of the lifetime of these gigantic deposits.

Objectives

Students should be able to:

1. Read and interpret pictographs.
2. Use contrasting data to draw conclusions.

Target Audience

Social Studies, Math.

Time Allotment

One-two class periods.

Materials

Map showing oil producing (and oil-potential) areas and accompanying Student Worksheet, pp 56-57
Graph #1: "Oil Production in the Two Gulfs: Millions of Barrels Per Day and Known Oil Reserves - 1977" and accompanying Student Worksheet, pp 58-60

Background Information

Note: There is much in the news today about how long we can expect oil to serve our needs. This lesson encourages students to estimate the total amount of oil in two of the largest producing areas by computing the lifetime of these reserves. The data does not take into account, however, that consumption rates are climbing steeply--a point we encourage you to emphasize to your students.

"The amount of fuel resource can be given in different ways as 'reserves', 'ultimately recoverable resources', and 'total resource base'. Reserves are the most conservative measure; they have already been discovered. At the other end is the total resource base, an educated guess at how much there is in all. The reasonable number is probably ultimately recoverable resource, the amount

of a resource which experts think can be recovered at an appropriate profit with present extraction techniques."[1] The figures in the table are based on the "Reserves" classification and thus give minimum lifetime values for oil use.

Teaching Strategies

Plunge directly into this lesson by distributing the map showing oil producing (and oil-potential) areas. The map does not have a title.

Have students answer the set of questions, assisting them when necessary.

Distribute the pictograph and the table and help students find the answers to each question. As a homework assignment, ask students to write a short paragraph explaining how oil is extracted, or prepare a short talk about the process.

[1] J.M. Fowler, "Energy: Present Problems, Future Potential," Science and Children, March 1978.

Lesson 2
Student Worksheet

OIL: Production Areas and Potential Areas
(Not printed on Student copy.)

Answer These:

1. What does the map show?
   (The map shows where oil is presently being pumped. It also shows potential oil-rich areas.)

2. Write a title on your map. Put your title here, too.
   (Possible choices could include the one shown here: OIL: Production Areas and Potential Areas.)

3. Use the key and an atlas or wall map to help you. Name four states that have a lot of oil.
   (Louisiana, Texas, California and Alaska.)

4. Near what body of water is the most intense drilling going on?
   (The Gulf of Mexico.)

5. What off-shore areas are possible places to look for oil?
   (Pacific coast, Gulf of Mexico, Atlantic Ocean and Alaska.)

Lesson 2
Student Worksheet:

Oil Production in the Two Gulfs: Millions of Barrels Per Day and Known Oil Reserves - 1977

Answer These:

1. What amount does each barrel represent?
   (One million barrels of oil.)

2. How many millions of barrels does the United States produce each day?
   (Eight.)

3. If you multiply your answer to question #2 by the number of days in a year, you will get the total production of crude oil in the U.S. (in millions of barrels) in an average year. What is it?
   (8 x 365 = 2,920, rounded off = 2,900.)

4. Sometimes it is easier to work with large numbers if you round them off to billions. By moving the decimal point to the left three places you can change the number from millions to billions. What is the answer to question #3 in billions?
   (2,920. = 2.920.)

5. What is the answer to question #4 (above) when it is rounded off to the nearest whole number?
   (Three.)

Note: It is important to note in your discussion with the class that these computations are based on the current consumption rates; if the rates go up the oil will be used up even faster.

Also, these computations are using only PROVEN reserves. If new oil fields are located, the time before the oil is used up will be expanded.

6. Your answer to question #5 is the approximate number of billions of barrels of crude oil produced in the U.S. at present production rates. The U.S. uses 5,332 million or about 5.3 billion (rounded off = 5) barrels of crude oil each year.

   a. How much more oil does the U.S. use than it produces?
   (5 billion - 3 billion = 2 billion.)

   b. From where do you think the U.S. gets the rest of the oil it needs?
   (We import it from other world regions.)

7. How many billions of barrels are in reserve in the United States?
   (32)

   How long will U.S. oil reserves last if we continue to pump it out at the rate of 3 billion barrels per year?
   (32 ÷ 3 = 10⅔ years.)

8. 13½ million barrels of oil are produced each day in the Persian Gulf region. Rounding this number to 14, how much oil does the Persian Gulf region produce in a year?
   (14 x 365 = 5,110)

9. Change the figure to billions of barrels.
(5,110 = 5)

10. How many billions of barrels of oil are in reserve in the Persian Gulf at this time?
(368)

How many times larger are their reserves than those of the United States?
(368 ÷ 32 = 11½ times.)

11. If the Persian Gulf countries continue to produce their oil at the same yearly rate, how long will their reserves last?
(368 ÷ 5 = 73 $\frac{3}{5}$ years.)

3. What Are the Risks and Dangers in Extracting and Transporting Oil?

Overview

This lesson discusses the methods of on-shore drilling in the Persian Gulf, and compares these to off-shore drilling in the Gulf of Mexico. The processes of extracting and transporting oil from both locations is shown in a flow chart. The dangers and risks involved in oil production are also addressed.

Objectives

Students should be able to:

1. State some similarities and differences between the operation of on-shore and off-shore drilling.
2. Explain the process of extracting oil.
3. List different methods of transporting oil.
4. Identify some of the dangers and risks involved in oil drilling.
5. Read and interpret a flow chart, and construct one.

Target Audience

Social Studies, Science.

Time Allotment

Two-three class periods.

Materials

Duplicated class sets of Flow Charts, pp 64-66
Story, "Trouble at Bravo 14," pp 61-63
Student Worksheet, "Red's Next Job," p 67
Story, "The Wreck of the *AMOCO CADIZ*," pp 69-71
Student Worksheet, "Understanding," pp 73-74

Background Information

The process of extracting oil is similar in on-shore and off-shore operations. However, industry faces more problems with off-shore drilling. The cost, for one thing, is seven times as much as on-shore, primarily because of special equipment, labor, insurance, and the general high cost of exploration. Typically, it takes about 30 months to begin useful production of oil, both on-shore and off-shore.

There are risks involved in both off-shore and on-shore drilling. Fires, explosions, and oil spills can and do occur. Leaks, spills and blow-outs on-shore in Alaska or in Los Angeles are just as damaging as off-shore ones, if not more so. However, off-shore leaks and spills, if they are large enough, can lead to long-term upsets in the delicate coastal ecology. Avoiding these can be very expensive and time consuming. These can translate into enormous sums of money.

Student Activity 1

The story about the exploits of Paul (Red) Adair and his crew has been adapted from the true account of the runaway well that occurred off the coast of Norway in the North Sea in May, 1977. Adair and his men were called in to cap the gusher after several attempts had failed.

Teaching Strategies

The story will help students visualize concepts about extracting oil, and serve as an excellent class discussion topic. Behind this story is a moral worth learning--that there is a price to pay for everything, that there is no such thing as a free lunch.

Before you give the story to the students, show them the picture of the gusher ("Trouble at Bravo 14"). Ask students to name some of the dangers and risks to people and the environment suggested in the picture. Ask: How would you keep the oil from gushing out? How much danger is there from fire? Would you expect to get paid a lot of money for doing this kind of work? Why? How often do you think oil wells become runaway wells? (You might mention that this does not happen often, but when it does, it is spectacular, and it is always a possibility.)

Give each student a copy of the story, "Trouble at Bravo 14." After students have read it, go over the clues in the story that provide an explanation of the procedure used in capping a well. Strengthen understanding of the ecological hazards from runaway wells (and oil spills in general). Encourage students to research other energy-related accidents to find out how people tried to clean up the mess, or acted to prevent these tragedies from happening again, in so far as it is ever possible to prevent them.

Student Activity 2

Step-by-Step on a Flow Chart

Next, use the Flow Chart with the whole class, using the following guide questions. Then add more of your own.

Extracting and Transporting Oil

Where is oil found?
(In the ground on-shore; and beneath the sea.)

In what way is an off-shore oil rig distinctly different from a land rig?
(Legs of the rig are sunk in seabed, anchored on a platform resting on pontoons, or on a barge with a drilling hatch.)

What is the process for drilling for oil?
(Follow the steps on the Flow Chart.)

How do we transport crude oil?
(Tankers, pipelines.)

How is it transported from the refinery?
(Tank truck, pipeline, rail.
Note: Some oil is transported by river barge which is not pictured.)

Concluding the Lesson

The Flow Chart is a valuable teaching tool. As such, it should be used as often as possible in this lesson. The pictures provide the clues to the meaning of new vocabulary words and illustrate the step-by-step process of extracting and transporting energy. The whole Flow Chart should help students visualize energy as a product or commodity. Use the Flow Chart as a springboard into a variety of classroom activities. For example, the students can imagine themselves to be a member of Red Adair's crew assigned to "capping" a runaway well. Or they can list the captions on the Flow Chart in order, and draw their own pictures of each step, or write their heroic exploits (using some new vocabulary words, of course!) of capping a dangerous gusher.

Extending the Learning

Have children do research projects on the topics of off-shore drilling, on-shore drilling, Paul "Red" Adair, or related areas.

For a classroom activity, the students can construct a bulletin board project using different art media. Ideas could include an example of on and off-shore wells, a runaway well, etc.

Have the students discuss how drilling platforms might affect marine life. (In conjunction with this discussion, show the film "The Steel Reefs," the story of a marine world that has developed under the oil drilling platforms in the Gulf of Mexico. This film can be obtained free on loan from American Petroleum Institute, 2101 L Street, N.W., Washington, D.C. 20037.)

Student Activity 3

Distribute copies of The Wreck of the Amoco Cadiz. Have the students read the news article of how the oil spill happened first, and then the story of the oil spill aftermath. The questions at the end of the story will serve to help students recall important short and long-term effects on the lives of people and on living organisms as a result of tanker accidents.

Answers to student activity tasks can be found on the next few pages.

March 19, 1978

The Wreck of the AMOCO CADIZ

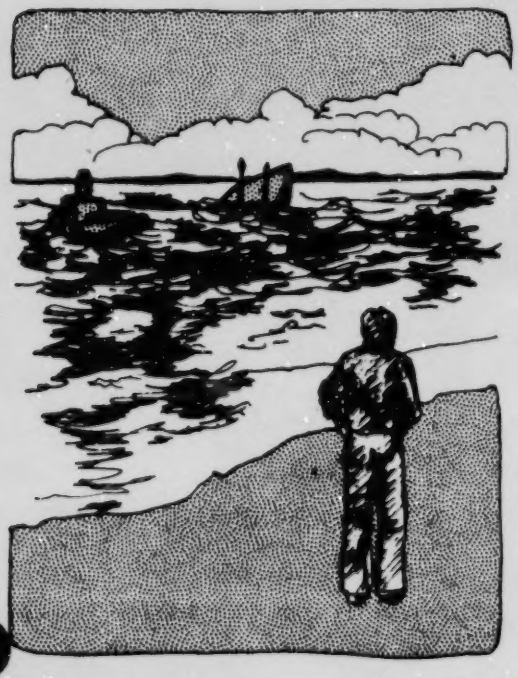
Supertanker Breaks Apart Off Coast Of Northern France

The people of France are cleaning up after the fourth major tanker wreck off the coast of Brittany in eleven years.

On March 16, 1978 the *Amoco Cadiz*, carrying 230,000 tons (over 70 million gallons) of light crude oil from the Middle East ran aground when the captain ordered the engines stopped after the ship's steering mechanism jammed.

Rough seas prevented other ships in the area from unloading the oil before the *Amoco Cadiz* broke in two in the shallow waters off the French coast.

French government officials are meeting to decide how to prevent further shoreline damages. The French Navy has been instructed to enforce an order preventing tankers from passing within seven miles of the coast.



Shoreline Impact of an Oil Spill

I think I noticed him standing there on the beach simply because he was the only person not moving quickly around. Everyone else seemed to be lifting something, or brushing something, or hauling buckets of things to some place away from the edge of the sea. He stood, still and quiet, his feet buried in hundreds of thousands of dead sea snails, his right hand touching clusters of periwinkles dying on nearby rocks. I saw him reach down to lift one tiny snail out of the blackened pile, and watched him try to brush away the oil with the sleeve of his sweater. Then I saw him drop the snail among its dead and dying brothers and turn with angry eyes toward the sea.

There in the mist, looking like some broken-backed sea monster, lay the supertanker, *Amoco Cadiz*, dead among the restless waves. Its cargo of oil spread mile upon mile across the waves. Here

on the shoreline the oil coated everything it touched with a thick, black ooze.

The man was a marine biologist. It is his job to help assess the damage to sea life in this region and to keep a record of its recovery from the spillage of sixty-six million gallons of crude oil. He knows the effects will be major and varied. To his relief there has been no gigantic fish kill reported. But oysters and other shell fish will have to be measured carefully to find out when the levels of petroleum hydrocarbons will go down enough to make them edible again.

He saw beaches as far away as sixty-five miles from the spill paved with dead sea urchins, razor clams, and dead snails. Now he is especially interested in finding out how much damage has been done to seaweed and kelp.

The people of Brittany in Northern France farm the sea like they do the land. They raise and harvest seaweed as we do wheat and corn and use it for medicines, food, and fertilizer. The biologist is sure that this year's crop is surely ruined. What, he wondered, will happen if the reproductive cells of seaweeds have been ruined as well? How could new colonies of these important seaweeds get started again?

Early scientific data tend to show that sea birds have been harmed by the oil. Over 5,000 dead birds were found along the shore, and hundreds more are struggling for life in makeshift bird hospitals. But the outlook for these oil-soaked birds is grim. Oil and sea birds simply don't mix.

Sea birds have thick feathers. This thickness provides almost perfect insulation from cold water. Oil destroys the structure of the feathers and exposes the bird's skin to freezing water. In addition, the bird loses much of its ability to float as the layer of air trapped between body and feathers disappears. As a result the bird rides lower in the water, and most likely can no longer feed itself.

If the bird does not die of starvation, it will sooner or later die from exposure. But the creature may float around for days, its heart beating in double time to compensate for the heat loss. Perhaps the end will be hastened by swallowing some of the oil, which acts like a poison.

But what if a bird is rescued, what are its chances? The biologist would have to shake his head. Bird rescues have not had much success in the past. Most rescue operations work in the same way--with the same poor results. First the bird is cleaned with mineral oil, and then the feathers air dried. However, the bird's delicate system does not recover quickly enough, and very few birds survive the cleaning and captivity.

The biologist began to worry that clean-up techniques for beaches as well as the birds might be doing more damage to the ecosystem than oil itself. For example, will steam hosing and brush cleaning of rocks and sand cause a whole new set of biological problems to set in?

It will be a long time before the shore will return to normal. For the present and for the near future, the cost to the people and to plant and animal life of Brittany has been immense.

Lesson 3
Student Worksheet: Understanding

1. Circle the sentence which describes the marine biologist's job.
   (See teacher's copy.)

2. Underline the names of plants and animals that have been damaged or killed by the oil.
   (See teacher's copy. Students should also underline periwinkles, on first page of the news account.)

3. Circle twice the sentences which describe the possible long-term damage to important seaweeds.
   (See teacher's copy.)

4. How are the sea birds harmed by oil?
   (Oil destroys the structure of the feathers and exposes the bird's skin to freezing water. It loses its ability to float high enough in the water to get food. Oil is toxic.)

5. Write the sentence that tells how the people of Brittany use seaweeds.
   (They raise and harvest seaweed as we do wheat and corn and use it for medicines, food, and fertilizer.)

6. The second paragraph in the news story mentions why the ship went aground. What was the reason?
   (The captain ordered the engines stopped after the steering mechanism jammed.)

7. How much oil was the tanker ship carrying?
   (230,000 tons.)

8. How did the French government decide to attack the problem of tanker oil spills damaging their shoreline in the future?
   (They decided to enforce the order preventing tankers from passing closer than seven miles of the coastline.)

9. How might more problems arise from clean-up operations after the oil spill?
(Cleaning the rocks and sand may destroy delicate ecosystem.)

10. Describe what you think people were lifting, brushing or hauling to safer places on the beach.
(Student answers will vary.)

Things Being Lifted

Things Being Brushed

Probably Being Hauled Away

4. Super Size

Overview

Super tankers like the one shown in the Student Guide (see page 75) are called Ultra Large Crude Carriers. The ULCC the students examine is the *Esso Atlantic*. It is 1148 feet long, 230 feet wide, has a draft of 92 feet, and carries 505,731 tons or about 160,000,000 gallons of oil. There are no existing ports in the United States capable of handling these mammoth ships. Some countries in the Persian Gulf have begun building their own super tanker fleets, perceiving correctly that transporting oil by tanker is the most economical method. This lesson, then, is designed to help students deal with size and large amounts. As such, it will help them describe sizes in numbers.

Objectives

Students should be able to:

1. Estimate size and make comparisons of sizes.
2. Describe quantitatively the size of a super tanker.
3. Discuss the pros and cons of super tanker ports.

Target Audience

Social Studies, Math.

Time Allotment

One class period.

Materials

Class sets of the following:

Picture of Super Tanker, p 75
Student Worksheet, "How Big? How Long? How Much?", pp 76-77
Map of the Gulf States and accompanying Student Worksheet, pp 78-80

Teaching Strategies

Duplicate the picture of the super tanker and give one to each student, or use the picture as a transparency on the overhead projector. Ask: "How many football games could be played at the same time on the deck of a super tanker?" *(Three.)*

Student Activity 1

"If one football field is 120 yards long, if you include the end zone, how many yards long is a super tanker? How can you prove it?"
(360 yards; multiply 120 x 3.)

Point out to your students that this sum is equal to three (choose the name of the local college or high school football field to insert at this time) _____ football fields!

Note: Measurements are given in customary units because the topic of football, where yards are gained, lost, or penalized, creates some problems in metric expression. Converting to meters, 360 yards is 328 meters.

Ask students if they can think of other comparisons. (An example follows.)

Most schoolyards can easily hold an outline chalk drawing of Columbus' flagship, the Santa Maria. Have students research the size of the Santa Maria, Noah's Ark (you will have to help them translate cubits into yards, in this case, however), or the approximate size of modern ocean-going ships. Then compare each to a super tanker.

Turn the class' attention toward the question of how much fuel can be transported in one of these giants of the sea. Ask: "How many barrels of oil can a super tanker hold?" *(See picture.)* "How many cars can the tanker fill up, if a car could use crude oil directly? How would you figure the amount in cars if we say that each car tank holds 20 gallons?" *(160,000,000 ÷ 20 = 8 million cars.)*

Distribute the problem sheet at this time and ask students to complete each question. It is called "How Big? How Long? How Much?"

Lesson 4
Student Worksheet: How Big? How Long? How Much?

1. The average classroom is 30 feet (915 cm) long. How many classrooms would equal the length of the super tanker which is 1,150 feet* (35,075 cm)?
(1,150 ÷ 30 = 38 classrooms or 35,075 ÷ 915 = 38.)

2. The average car is 16 feet (488 cm) long. How many cars would equal the length of the super tanker?
(1,150 ÷ 16 = 72 cars or 35,075 ÷ 480 = 72.)

3. The average student in your grade is 5 feet tall. How many of your classmates, lying head to toe, would equal the length of the super tanker?
(1,150 ÷ 5 = 230 students or 35,075 ÷ 153 = 230.)

4. We know a super tanker is 1,150 feet (35,075 cm) long.* It is also 230 (7,015 cm) wide. How many square feet are on the surface?
(264,500 square feet; 246,050,000 cm^2 or 24,605 m^2.)

   If a car is 16 feet (488 cm) long and 6 feet wide (183 cm) wide, what is the area of the car?
(96 square feet or 89,300 cm^2.)

   How many cars can fit on the surface of the super tanker?
(264,500 ÷ 96 = 2,755 cars or 246,050,000 ÷ 89,300 = 2,755.)

*The *Esso Atlantic* is 1,148 feet long, 230 feet wide, has a draft of 92 feet, carries 508,731 tons or about 160,000,000 gallons of oil.

5. A tanker carrying 55,000,000 gallons (208 million liters) of oil can supply an average family car with enough gas to make nine trips to the sun and back. The sun is 93,000,000 miles (148.8 million km) from the earth. The super tanker holds 160,000,000 gallons (605 million liters) of oil. How many round trips to the sun and back could the family car take with this amount of oil?

{160,000,000 ÷ 55,000,000 = 2.9

or

605 (million liters) ÷ 208 (million liters) = 2.9

then

2.9 x 9 = 26.1 round trips.

55 million ⟶ 9 round trips
160 million ⟶ 26.1 round trips}

Note: Help students see that a fraction is significant in this example. You might mention that if you have an extra 1/10 a round trip (which you would be if you rounded 26.1 to 26), you are left somewhere out in space.

Student Activity 2

Super tankers have to have somewhere to load the crude oil on board, and to unload it. At the present time, the United States does not have any super tanker ports. But Japan and some countries in the Persian Gulf do have such ports. One of the world's largest is on the coast of Iran. This port can load six million barrels of crude oil in twenty-four hours. This is more than the combined daily needs of France, Italy, and Spain.

You may wish to have students recall some of the environmental considerations of this much oil and the risks involved. Discuss increased insurance costs, oil spills, and leaks, dumped oil wastes, etc., and damages to water life.

Mention that plans for the United States include the building of super tanker ports. Distribute the map of the Gulf of Mexico, and have the students answer each question on the map worksheet. Discuss their answers in class.

Lesson 4
Student Worksheet: Map of the Gulf States

Maps of large areas can never be as big as the areas they show. Distance on a map is always in smaller units than the actual distance. A person who makes a map has to decide what scale to use. The scale is distance in kilometers or miles, shown on the map as centimeters or inches.

Using the Large Map

1. How many miles does an inch show on this map?
   (200 miles.)

2. What distance, in kilometers, does one centimeter show?
   (128 kilometers.)

3. Lay a piece of paper on the scale and mark off the distance between the city of Houston (Texas) and the place where the border between Texas and Louisiana ends at the Gulf of Mexico. Then, figure out, in miles and kilometers, what that distance is.
   (About 320 kilometers (200 miles).)

4. The x mark on the map marks the place where the first U.S. super tanker port is to be built. The distance from this place north to the Texas-Louisiana border is about how many kilometers? Circle the correct letter.

   (a) 65.6 kilometers (41 miles)

   (b) 49.6 kilometers (31 miles)

   (c) 40.0 kilometers (25 miles)

Using the Inset Map

5. Compare the inset map with the large map.
   (a) What part of the large map does it show?
   (Galveston Bay area.)
   (b) How many miles does an inch show on this map?
   (75 miles.)
   (c) Are Houston and Freeport the same distance in miles apart on both maps? Explain.
   (They are the same distance apart in miles on both maps, but they don't appear to be so because of the different sizes of the two maps.)

6. What distance, in kilometers, does one centimeter show?
   (48 kilometers.)

7. Another place for a super tanker port lies 20 miles southeast of Freeport, Texas. See (x) on the large map. Figure out where the (x) should be placed on the inset map to show the port. Mark the place.
   (See teacher map for approximate location.)

8. Why, do you think, map makers use inset maps?
   (Map makers use inset maps to show more detail.)

5. Two Worlds

Overview

This lesson introduces the students to a wide variety of interpreting skills. These are the skills essential to critical thinking and common to the objectives of general education. They may be summarized under the headings of reading maps, tables, case studies, and interpreting and applying information. This last is intended to help students gain increasing competence in presenting information in the form of a report.

Objectives

Students should be able to:

1. Compare scales on maps.
2. Compare the resources and technology of people living in the Houston, Texas region and Kuwait in the Persian Gulf.
3. Determine how people in both Gulfs use energy supplies.
4. Interpret a graph showing energy producers and users.
5. Prepare a short report based on comparison data researched in the library.

Target Audience

Social Studies.

Time Allotment

One-two class periods.

Materials

Class sets of Student Worksheet: "Two Energy Gulfs" and the two maps that accompany this Student Worksheet, pp 81-82
Map, "Millions of Barrels Per Day (Projection for 1980), p 83
Student Worksheet, "Where Does Oil Stack Up?" p 84
Story, "Ahmed and Peter" and accompanying Student Worksheet, pp 85-90
Student Worksheet, "How People Live in Kuwait," pp 91-92

39

Introducing the Lesson	Start with the map reading skill. This particular activity reinforces students' ability to read an inset map and determine scale. Help them locate the general regions of Kuwait and Houston, Texas and find them on a globe.
Developing the Lesson	Then turn the class' attention to either the case studies about Ahmed and Peter, or to the table comparing the lifestyles of people living in Kuwait (or another country in the Middle East they may prefer to study) to those living in the United States. This comparison is designed to help guide their own research comparing the people living in the United States to those living in other regions of the world. The product of the research assignment can take the form of an oral or written report, once the data is collected. The case study of Ahmed and Peter can become a directed reading activity. With the questions, it can help develop critical thinking.
Concluding the Lesson	This lesson completes the unit Two Energy Gulfs. We suggest that you use the objective test as a formal evaluation tool of the understandings and skills your students have acquired. Teacher's Key can be found on pages 45-47.

Lesson 5
Student Worksheet: Two Energy Gulfs

Using the large maps:

1. Draw a circle around Kuwait.

2. Draw a circle around Houston, Texas.

Which Direction?

3. a. Kuwait is located *(north)* of Saudi Arabia.

   north east south west

   b. Freeport, Louisiana is located *(south)* of Houston, Texas.

   north east south west

4. Kuwait is located on which gulf, the Gulf of Mexico or the Persian Gulf? *(Persian.)*

5. Which country is north of Kuwait? *(Iraq.)*
   Which country is east of Kuwait? *(Iran.)*

Lesson 5
Student Worksheet: Where Does Oil Stack Up?

Look at the map. Then answer the questions.

1. Does the United States produce as much oil as the Middle East?
(No.)

2. Which uses more oil--the United States or the Middle East?
(United States.)

3. Which has more people--the United States or the Middle East?
(United States.)

4. Which probably uses all the oil it produces--the United States or Middle East?
(United States.)

5. Which probably cannot use all their oil?
(Middle East.)

6. If you had more of something than you could use, what would you probably do with the extra?
(Sell it.)

42

Lesson 5
Student Worksheet: About the Story: Ahmed and Peter

Mark a *T* in the blank if the sentence is true. Write an *F* if it is false.

T 1. Kuwait and Houston have hot summers.

T 2. Money from selling oil and gas help to build hospitals in Kuwait.

F 3. Houston and Kuwait are on the same gulf.

T 4. Houston has more people and machines than Kuwait.

F 5. Kuwait sells some of its large supply of fresh water.

T 6. Salt water can be made into fresh water.

T 7. Ahmed receives free medicine and school books when he needs them.

T 8. People in Houston get many services by paying taxes.

T 9. Kuwait and Houston depend on oil to make life more comfortable.

F 10. Kuwait uses more oil than Houston.

Unit Test

TWO ENERGY GULFS

Choose the correct answer.

B 1. What is a gulf?

(a) a body of land surrounded by water on all sides.
(b) a wide inlet of the ocean.
(c) a very shallow stream of water.

C 2. Where are the two largest oil fields in the world.

(a) Southern California and the Rocky Mountains.
(b) Ural Mountains and Lake Maracaibo.
(c) Gulf of Mexico and the Persian Gulf.

A 3. Petroleum is formed over millions of years under great pressure and heat. It is formed from:

(a) plant and animal life.
(b) crushed rocks.
(c) petrified wood.

C 4. Why are the known oil reserves found near large bodies of water?

(a) glaciers slid across the earth leaving deposits of oil.
(b) volcanoes spilled out oil near the shorelines.
(c) plant and animal life lived there.

A 5. The movement of ocean water is called a:

(a) current.
(b) circuit.
(c) gulf.

C 6. Kuwait consumes:

(a) more oil than it produces.
(b) the same amount it produces.
(c) less oil than it produces.

Matching Test--Match Column A with Column B by placing the correct letter in front of the appropriate number.

	Column A	Column B
D 7.	Gulf of Mexico	A. largest oil producing area in the world
F 8.	to get oil out of the ground	B. risks and dangers of oil drilling
A 9.	Persian Gulf	C. oil that has been discovered but not extracted
H 10.	8 million barrels per day	D. off-shore drilling
B 11.	fires, explosions, spills	E. a unit for measuring oil
G 12.	consumption rate	F. usually extract with pumps
C 13.	reserves	G. how fast oil is being used
E 14.	barrels	H. oil production in the United States
I 15.	pipeline	I. way of transporting oil from on-shore wells

True or False

True 16. The continents were once connected to each other.

True 17. A seismograph is one instrument used to find oil.

False 18. The Gulf of Mexico produces more oil than any other region in the world.

False 19. Kuwait is located on the Gulf of Mexico.

Choose the letter of the best source for each type of information. Put the letter in the blank.

A--graph B--flow chart C--case study

D--picture E--map

Which source of information would be best to:

C 20. show how someone's life has changed.

E 21. locate a gulf.

B or D 22. show how oil is transported from well to refinery to consumer.

A 23. show how much oil has been used in five years.

D 24. show the size of a super tanker.

Optional

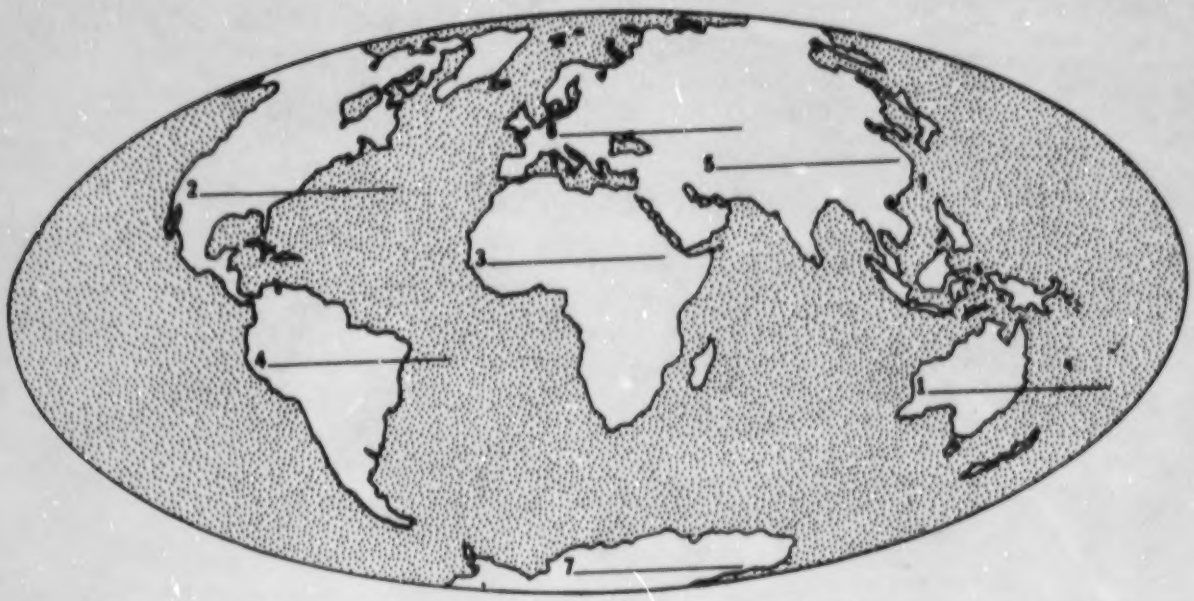
Compare life in Kuwait with life in the United States. How has oil changed life in Kuwait? In the United States? How has oil changed education, medical services, goods, services, and recreation? Answer fully.

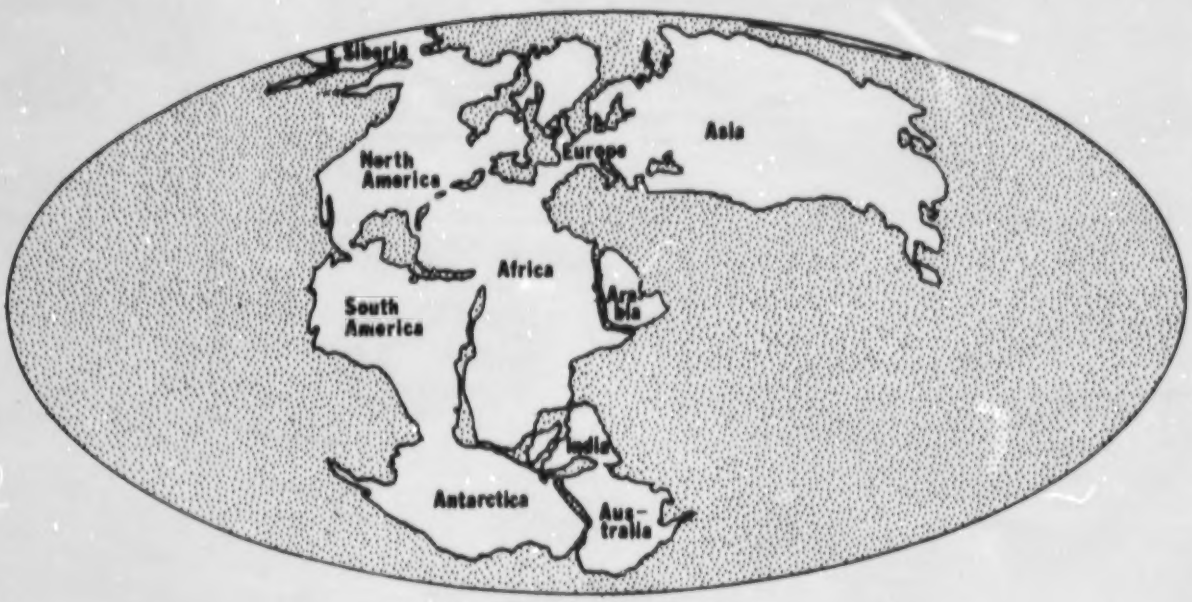
Student Guide

Lesson 1

Map 1

The World As It is Today





Map 2

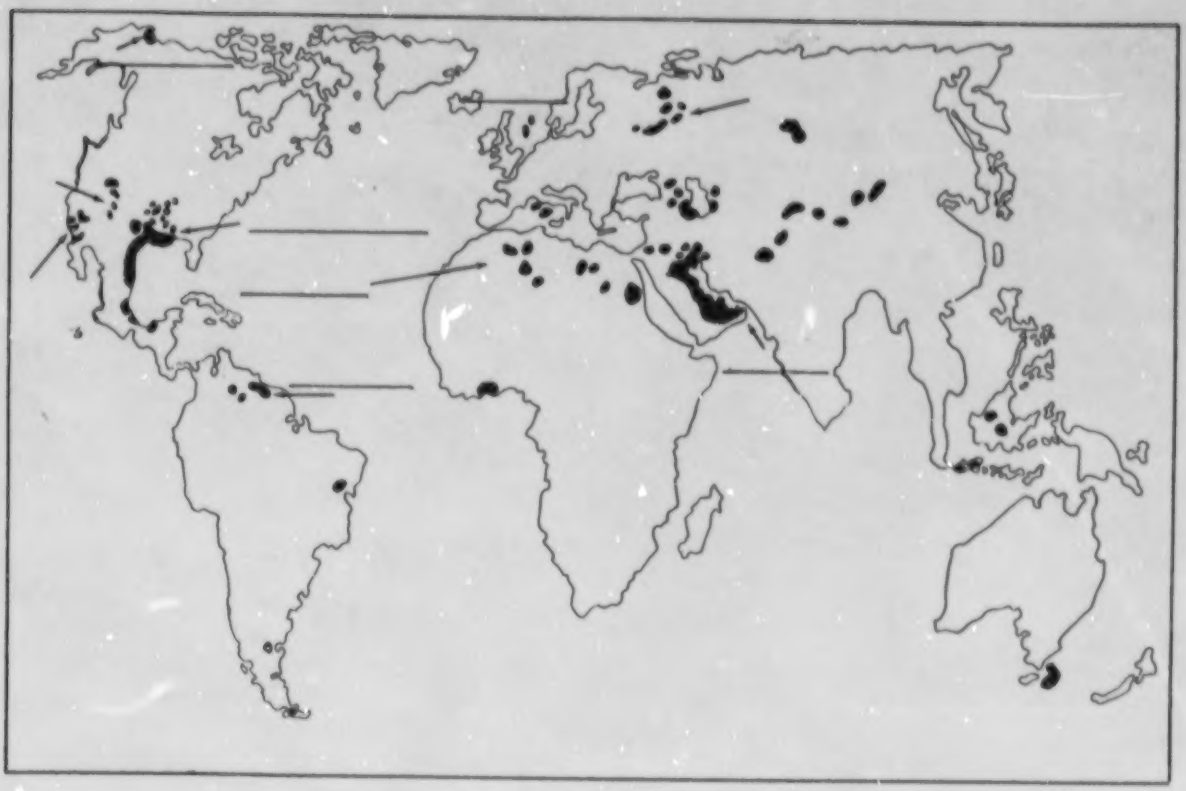
The World 50 Million Years Ago

51

Map 3

World Ocean Current Patterns

Map 4:
Major Oil Accumulations



The map above shows where major oil accumulations exist. Can you name these places? Put the letters GM where you see the Gulf of Mexico; LM for Lake Maracaibo (Venezuela); AL, Algeria and Libya; PG, Persian Gulf; NS, North Sea; PB, Prudhoe Bay (Alaska).

Use an atlas to check your answers.

World Petroleum Producing Areas - 1977

Answer the following:

1. What energy source is shown on the map?

2. What is another word for petroleum?

3. The map shows many large oil producing areas. Which are the two largest?

4. What word is used in both of these large oil fields?

5. Look carefully at the map. How would you describe a gulf?

6. What is an energy gulf?

Lesson 1
Student Worksheet: Summing Up

Answer each question below in a full sentence.

1. What is a continent?

2. What are the names of the world continents?

3. What did the world's land look like 150 million years ago?

4. What did ancient ocean currents have to do with today's oil deposits?

5. What things would you look at, if you had the job of finding oil?

70°
Alaska
CANADA
60°
160°
150°
140°
Intense Drilling Activity
Areas Where Potential
For New Finds is Good
or Very Good
40°
30°
N
120°
110°
90°
80°

Lesson 2
Student Worksheet

Answer These:

1. What does the map show?

2. Write a title on your map. Put your title here, too.

3. Name three states that have a lot of oil.

4. Where in the United States is the most intense drilling going on? Near what body of water?

5. What off-shore areas are possible places to look for oil?

Graph #1: OIL PRODUCTION IN THE TWO GULFS: MILLIONS OF BARRELS PER DAY - 1977

	EACH = 1 million barrels
UNITED STATES OF AMERICA	
PERSIAN GULF COUNTRIES:	
SAUDI ARABIA	
UNITED ARAB EMIRATES	
KUWAIT	
QATAR	

KNOWN OIL RESERVES - 1977	
	OIL RESERVES IN BILLIONS OF BARRELS
UNITED STATES (Including the Gulf of Mexico)	32
PERSIAN GULF	368

Answer These:

1. What amount does each barrel represent?

2. How many millions of barrels does the United States produce each day?

3. If you multiply your answer to question #2 by the number of days in a year, you will get the total production of crude oil in the U.S. (in millions of barrels) in an average year. What is it?

4. Sometimes it is easier to work with large numbers if you round them off to billions. By moving the decimal point to the left three places you change the number from millions to billions. What is the answer to question #3 in billions?

5. What is the answer to question #4 (above) when it is rounded off to the nearest whole number?

6. Your answer to question #5 is the approximate number of billions of barrels of crude oil produced in the U.S. at present production rates. The U.S. uses 5,332 million or about 5.3 billion (rounded off = 5) barrels of crude oil each year.

   a. How much more oil does the U.S. use than it produces?

   b. From where do you think the U.S. gets the rest of the oil it needs?

7. How many billions of barrels are in reserve in the United States?

   How long will U.S. oil reserves last if we continue to pump it out at the rate of 3 billion barrels per year?

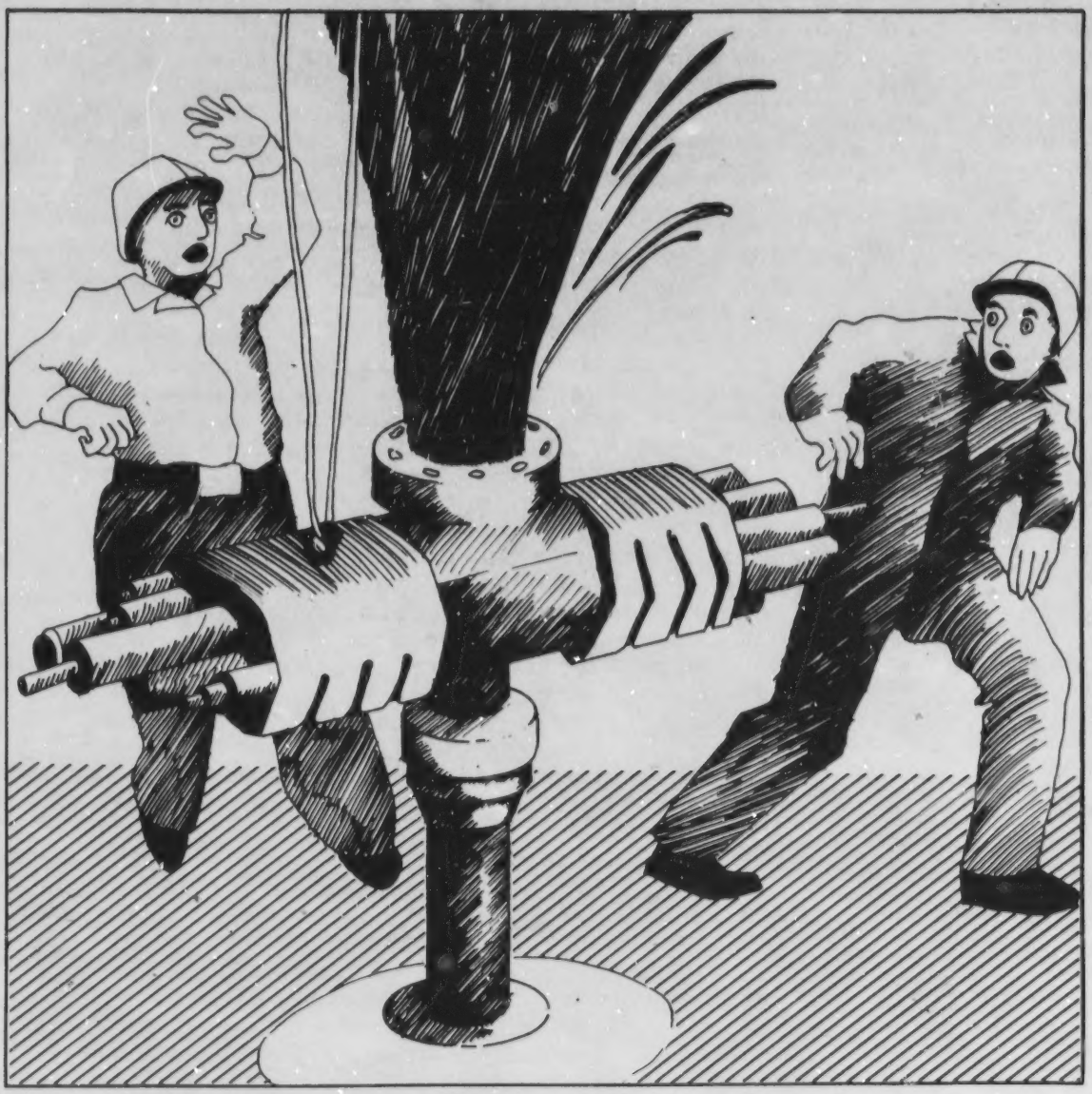
8. 13½ million barrels of oil are produced each day in the Persian Gulf region. Rounding this number to 14, how much oil does the Persian Gulf region produce in a <u>year</u>?

9. Change the figure to <u>billions</u> of barrels.

10. How many billions of barrels of oil are in reserve in the Persian Gulf at this time?

How many times larger are their reserves than those of the United States?

11. If the Persian Gulf countries continue to produce their oil at the same yearly rate, how long will their reserves last?



TROUBLE AT BRAVO 14

The men at Bravo 14 oil well, off the coast of Norway in the North Sea, discovered that a gauge they had lowered into the well had become stuck, partly blocking the flow of oil.

To get the gauge out, they knew they had to shut down the well. None of the roustabouts liked doing this job. It could be dangerous; it was always tricky.

The roustabouts began working around the clock pumping tons of heavy drilling mud into the pipe. The mud was supposed to block the flow of oil. When it stopped, they could then take out the valves at the wellhead and get the stuck gauge out.

Harris, the roustabout other crew members called the "Old Man" because he had worked on oil rigs for many years, was the first one to see mud leaking from the pipe. "Get outa here," yelled Harris. His voice rose even higher with his second warning, "She's a runaway!" The crew ran for their lives.

Bravo 14 turned into a geyser of hot, red-brown crude oil shooting two hundred feet into the air. It gushed for a week, pouring five million gallons of crude oil into the ocean, and making an oil slick 36 miles long and 32 miles wide. The oil slick was headed for the seashores of Europe.

Newspapers carried long stories about the runaway oil well, and Bravo 14 soon became a familiar name. In several stories, newspaper reporters explained the cause of the blowout. It seems that when the roustabouts thought the mud had done its job, they began to remove the valves. And to be extra safe, they put in a blowout preventer over the open wellhead. But they put the preventer in upside down. They had gotten only two bolts fastened when Bravo 14 blew.

Each day the roustabouts tried to cap the well. And each day they failed.

Finally Red Adair himself was called in. He and his crew of two men, Boots and Toots, have put out oil fires and capped gushers all over the world. At Bravo 14, Red, Boots and Toots, wearing their red flameproof suits, waded into the roaring oil and water.

Working with speed and care, they installed a pair of steel rams around the spurting well-head. Then they backed out and turned on the power. The rams slipped smoothly forward and pinched the pipe shut. The geyser stopped.

"Not a real big job," said Adair to reporters later. "What we call a medium big job."

"Where to next, Red?" asked a reporter.

"There's a well on fire in Arabia. I'm heading there now. It might be a tough one, though."

He winked at the reporters when he said that.

* * * * *

New Vocabulary

gauge: an instrument for testing the pressure or flow of oil.

roustabouts: the men working on the well.

valves: mechanical instruments used to start and stop flow through the pipes.

wellhead: the equipment at the top of the pipe.

blowout preventer: a machine to plug a well in an emergency to prevent the flow of oil or gas.

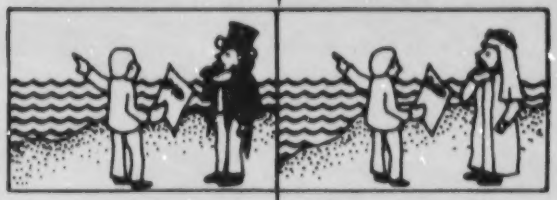
geyser: a spray of oil, or gas or water that shoots into the air from beneath the earth's surface, caused by pressure.

runaway well: an uncontrollable well.

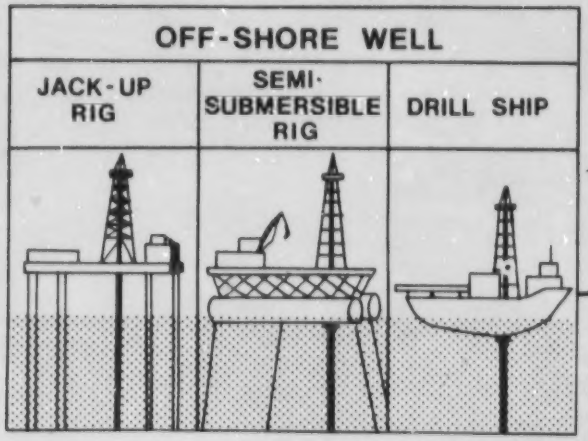
rams: huge clamps used on oil pipes.

Seismographic Surveys

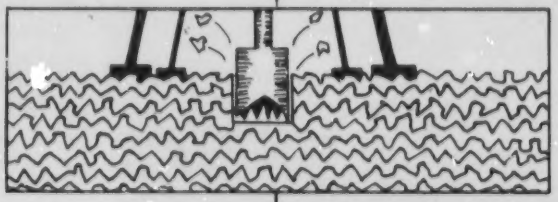
Company Bids for Government Contract



GULF OF MEXICO

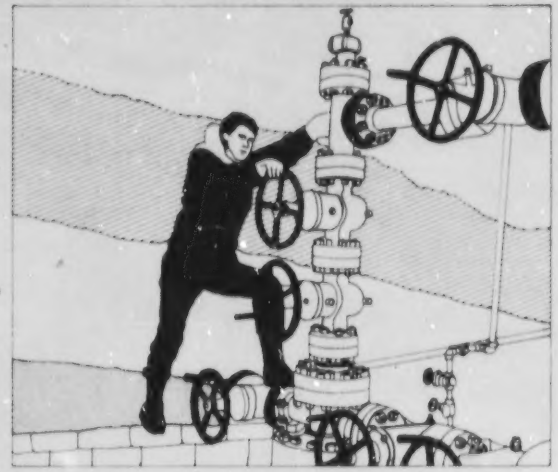


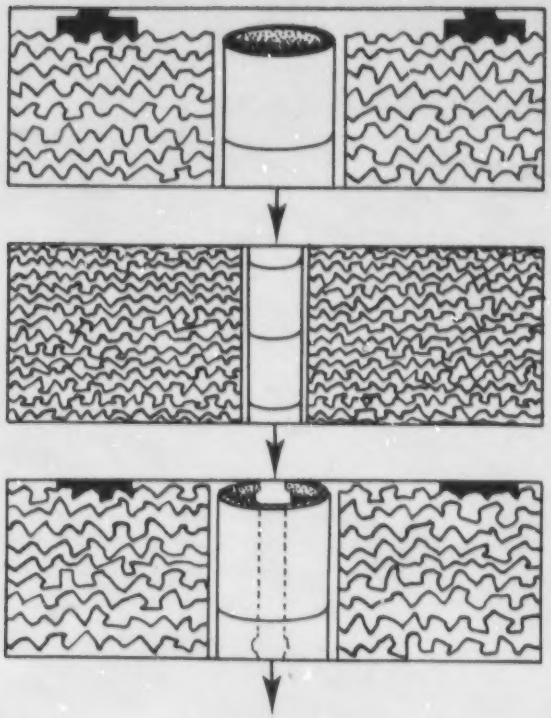
Exploratory Drilling



Drill Cuts Hole in Rock

PERSIAN GULF

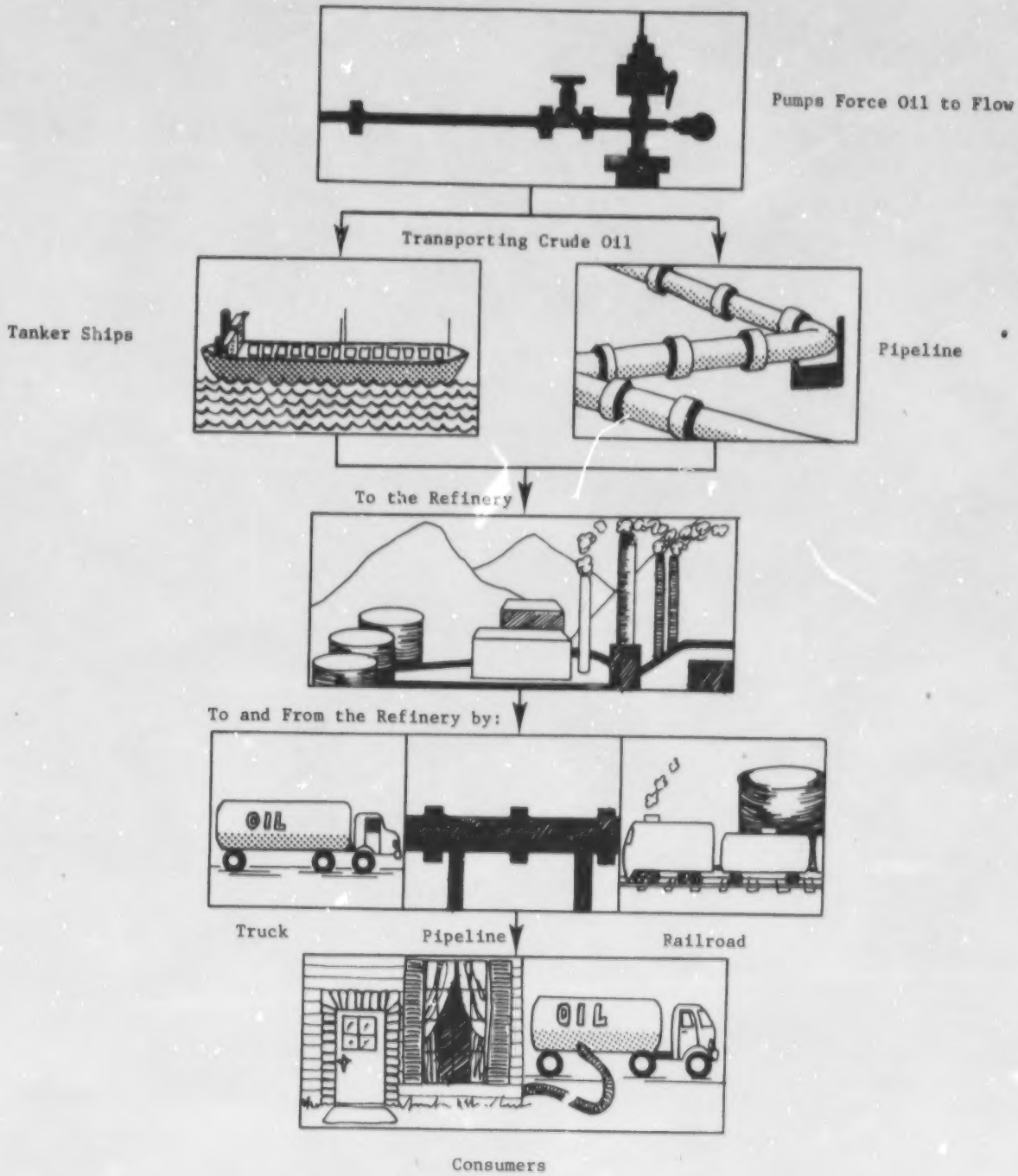




Bit (cutting tool) is removed. Round steel casing is cemented in place so the walls of the hole won't cave in.

Repeat process of step above to form a string of casings.

Tubing (smaller pipe) is placed inside casing.


Pumps Force Oil to Flow
Transporting Crude Oil
Tanker Ships
Pipeline
To the Refinery
To and From the Refinery by:
OIL
Truck
Pipeline
Railroad
OIL
Consumers

Lesson 3
Student Worksheet: Red's Next Job

Write a story about Red's next job. Use as many new vocabulary words as you can. Use the space below for your story.

March 19, 1978

The Wreck of the AMOCO CADIZ

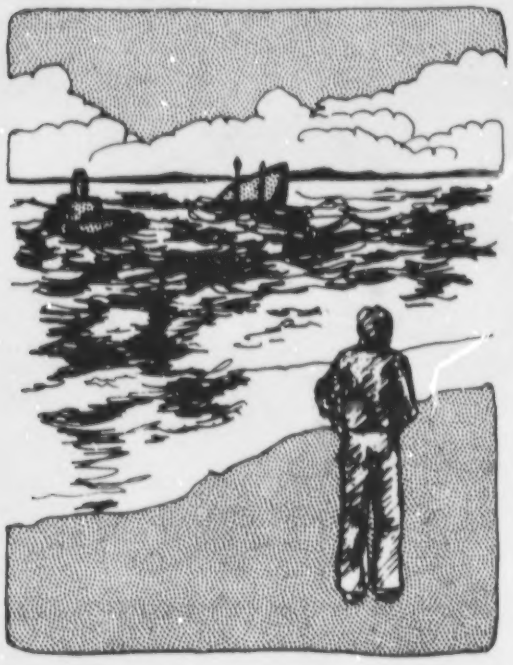
Supertanker Breaks Apart Off Coast Of Northern France

The people of France are cleaning up after the fourth major tanker wreck off the coast of Brittany in eleven years.

On March 16, 1978 the *Amoco Cadiz*, carrying 230,000 tons (over 70 million gallons) of light crude oil from the Middle East ran aground when the captain ordered the engines stopped after the ship's steering mechanism jammed.

Rough seas prevented other ships in the area from unloading the oil before the *Amoco Cadiz* broke in two in the shallow waters off the French coast.

French government officials are meeting to decide how to prevent further shoreline damages. The French Navy has been instructed to enforce an order preventing tankers from passing within seven miles of the coast.



Shoreline Impact of an Oil Spill

I think I noticed him standing there on the beach simply because he was the only person not moving quickly around. Everyone else seemed to be lifting something, or brushing something, or hauling buckets of things to some place away from the edge of the sea. He stood, still and quiet, his feet buried in hundreds of thousands of dead sea snails, his right hand touching clusters of periwinkles dying on nearby rocks. I saw him reach down to lift one tiny snail out of the blackened pile, and watched him try to brush away the oil with the sleeve of his sweater. Then I saw him drop the snail among its dead and dying brothers and turn with angry eyes toward the sea.

There in the mist, looking like some broken-backed sea monster, lay the supertanker, *Amoco Cadiz*, dead among the restless waves. Its cargo of oil spread mile upon mile across the waves. Here

on the shoreline the oil coated everything it touched with a thick, black ooze.

The man was a marine biologist. It is his job to help assess the damage to sea life in this region and to keep a record of its recovery from the spillage of sixty-six million gallons of crude oil. He knows the effects will be major and varied. To his relief there has been no gigantic fish kill reported. But oysters and other shell fish will have to be measured carefully to find out when the levels of petroleum hydrocarbons will go down enough to make them edible again.

He saw beaches as far away as sixty-five miles from the spill paved with dead sea urchins, razor clams, and dead snails. Now he is especially interested in finding out how much damage has been done to seaweed and kelp.

The people of Brittany in Northern France farm the sea like they do the land. They raise and harvest seaweed as we do wheat and corn and use it for medicines, food, and fertilizer. The biologist is sure that this year's crop is surely ruined. What, he wondered, will happen if the reproductive cells of seaweed have been ruined as well. How could new colonies of these important seaweeds get started again?

Early scientific data tend to show that sea birds have been harmed by the oil. Over 5,000 dead birds were found along the shore, and hundreds more are struggling for life in makeshift bird hospitals. But the outlook for these oil-soaked birds is grim. Oil and sea birds simply don't mix.

Sea birds have thick feathers. This thickness provides almost perfect insulation from cold water. Oil destroys the structure of the feathers and exposes the bird's skin to freezing water. In addition, the bird loses much of its ability to float as the layer of air trapped between body and feathers disappears. As a result the bird rides lower in the water, and most likely can no longer feed itself.

If the bird does not die of starvation, it will sooner or later die from exposure. But the creature may float around for days, its heart beating in double time to compensate for the heat loss. Perhaps the end will be hastened by swallowing some of the oil, which acts like a poison.

But what if a bird is rescued, what are its chances? The biologist would have to shake his head. Bird rescues have not had much success in the past. Most rescue operations work in the same way--with the same poor results. First the bird is cleaned with mineral oil, and then the feathers air dried. However, the bird's delicate system does not recover quickly enough, and very few birds survive the cleaning and captivity.

The biologist began to worry that clean-up techniques for beaches as well as the birds might be doing more damage to the ecosystem than oil itself. For example, will steam hosing and brush cleaning of rocks and sand cause a whole new set of biological problems to set in?

It will be a long time before the shore will return to normal. For the present and for the near future, the cost to the people and to plant and animal life of Brittany has been immense.

Lesson 3
Student Worksheet: Understanding

1. Circle the sentence which describes the marine biologist's job.

2. Underline the names of plants and animals that have been damaged or killed by the oil.

3. Circle twice the sentences which describe the possible long-term damage to important seaweeds.

4. How are sea birds harmed by oil?

5. Write the sentence that tells how the people of Brittany use seaweeds.

6. The second paragraph in the news story mentions why the ship went aground. What was the reason?

7. How much oil was the tankership carrying?

8. How did the French government decide to attack the problem of tanker oil spills damaging their shoreline in the future?

9. How might more problems arise from clean-up operations after the oil spill?

10. Describe what you think people were lifting, brushing or hauling to safer places on the beach.

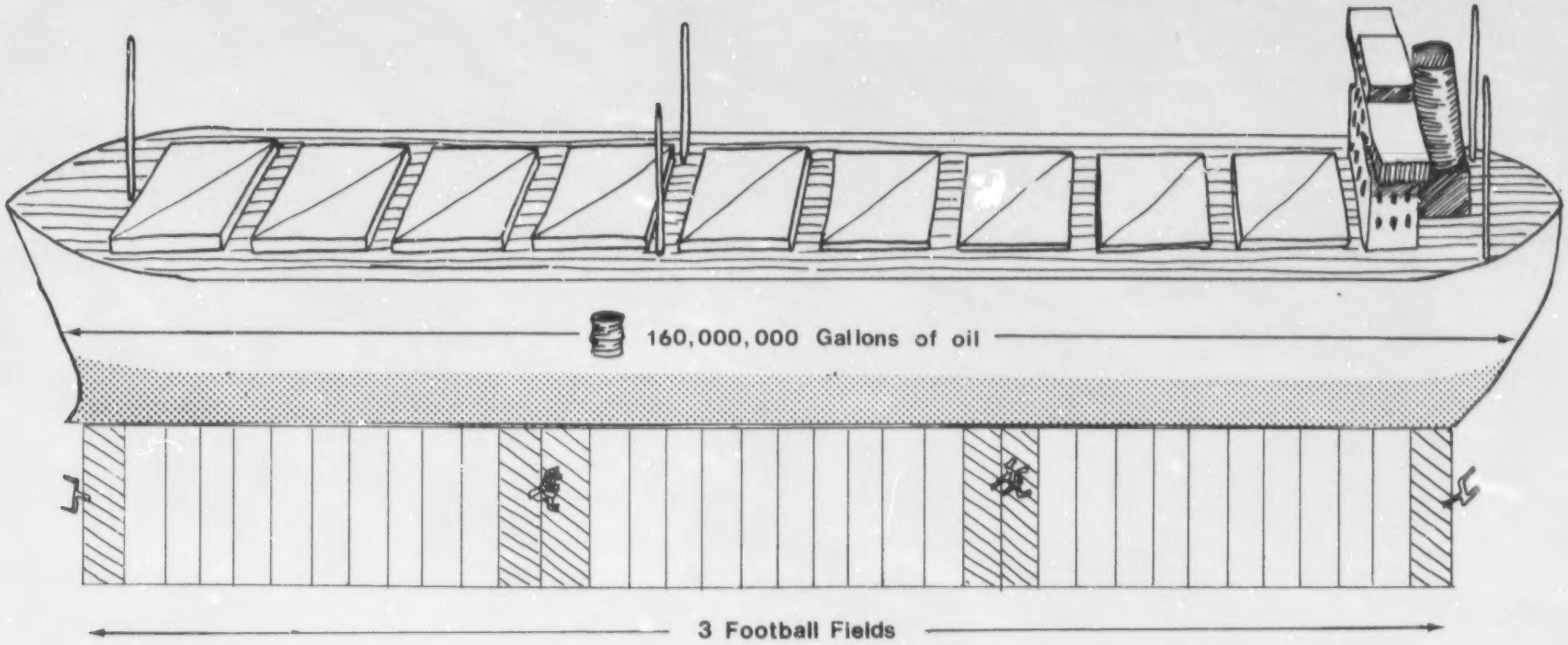
Things Being Lifted

Things Being Brushed

Probably Being Hauled Away

Super Tanker

(Ultra Large Crude Carrier - ULCC)



Lesson 4
Student Worksheet: How Big? How Long? How Much?

1. The average classroom is 30 feet (915 cm) long. How many classrooms would equal the length of the super tanker which is 1,150 feet* (35,075 cm)?

2. The average car is 16 feet (488 cm) long. How many cars would equal the length of the super tanker?

3. The average student in your grade is 5 feet tall. How many of your classmates, lying head to toe, would equal the length of the super tanker?

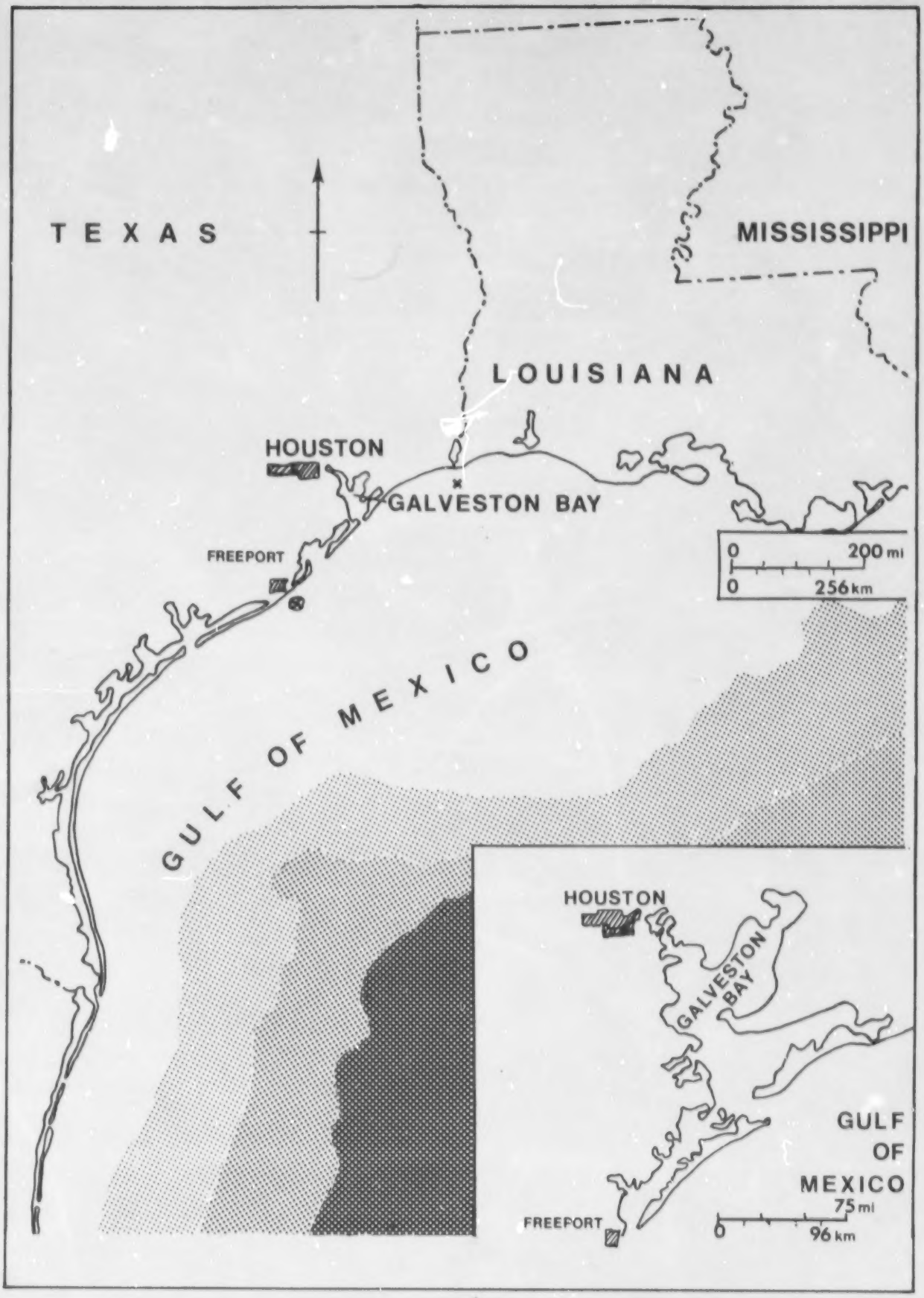
4. We know a super tanker is 1,150 feet (35,075 cm) long*. It is also 230 feet (7,017 cm) wide. How many square feet are on the surface?

   If a car is 16 feet (488 cm) long and 6 feet wide (183 cm) wide, what is the area of the car?

   How many cars can fit on the surface of the super tanker?

*The *Esso Atlantic* is 1,148 feet long, 230 feet wide, has a draft of 92 feet, carries 508,731 tons or about 160,000,000 gallons of oil.

5. A tanker carrying 55,000,000 gallons (208 million liters) of oil can supply an average family car with enough gas to make nine trips to the sun and back. The sun is 93,000,000 miles (148.8 million km) from the earth. The super tanker hold 160,000,000 gallons (605 million liters) of oil. How many round trips to the sun and back could the family car take with this amount of oil?


TEXAS
MISSISSIPPI
LOUISIANA
HOUSTON
GALVESTON BAY
FREEPORT
0 200 mi
0 256 km
GULF OF MEXICO
HOUSTON
GALVESTON BAY
GULF OF MEXICO
FREEPORT
0 75 mi
96 km

Lesson 4
Student Worksheet: Map of the Gulf States

Maps of large areas can never be as big as the areas they show. Distance on a map is always in smaller units than the actual distance. A person who makes a map has to decide what scale to use. The scale is distance in kilometers or miles shown on the map as centimeters or inches.

Using the Large Map

1. How many miles does an inch show on this map?

2. What distance, in kilometers, does one centimeter show?

3. Lay a piece of paper on the scale and mark off the distance between the city of Houston (Texas) and the place where the border between Texas and Louisiana ends at the Gulf of Mexico. Then figure out in miles and kilometers what that distance is.

4. The x mark on the map marks the place where the first U.S. super tanker port is to be built. The distance from this place north to the Texas-Louisiana border is about how many kilometers? Circle the correct the correct letter.

   (a) 65.6 kilometers (41 miles)

   (b) 49.6 kilometers (31 miles)

   (c) 40.0 kilometers (25 miles)

Using the Inset Map

5. Compare the inset map with the large map.
   (a) What part of the large map does it show?

   (b) How many miles does an inch show on this map?

   (c) Are Houston and Freeport the same distance in miles apart on both maps? Explain.

6. What distance, in kilometers, does one centimeter show?

7. Another place for a super tanker port lies 20 miles southeast of Freeport, Texas. See (x) on the large map. Figure out where the (x) should be placed on the inset map to show the port. Mark the place.

8. Why, do you think, do map makers use inset maps?

TEXAS
MISSISSIPPI
LOUISIANA
HOUSTON
GALVESTON BAY
FREEPORT
GULF OF MEXICO
0 200 mi
0 256 km
HOUSTON
GALVESTON BAY
GULF OF MEXICO
FREEPORT
75 mi
0 96 km

78

N
IRAQ
KUWAIT
PERSIAN GULF
IRAN
SAUDI ARABIA
QATAR
0 60 mi
0 204 km
IRAN
IRAQ
PERSIAN GULF
KUWAIT
NEUTRAL ZONE
0 50 mi
0 64 km
SAUDI ARABIA

79

Lesson 5
Student Worksheet: Two Energy Gulfs

Using the large maps;

1. Draw a circle around Kuwait.

2. Draw a circle around Houston, Texas.

Which Direction?

3. a. Kuwait is located _ _____ of Saudi Arabia.

   north east south west

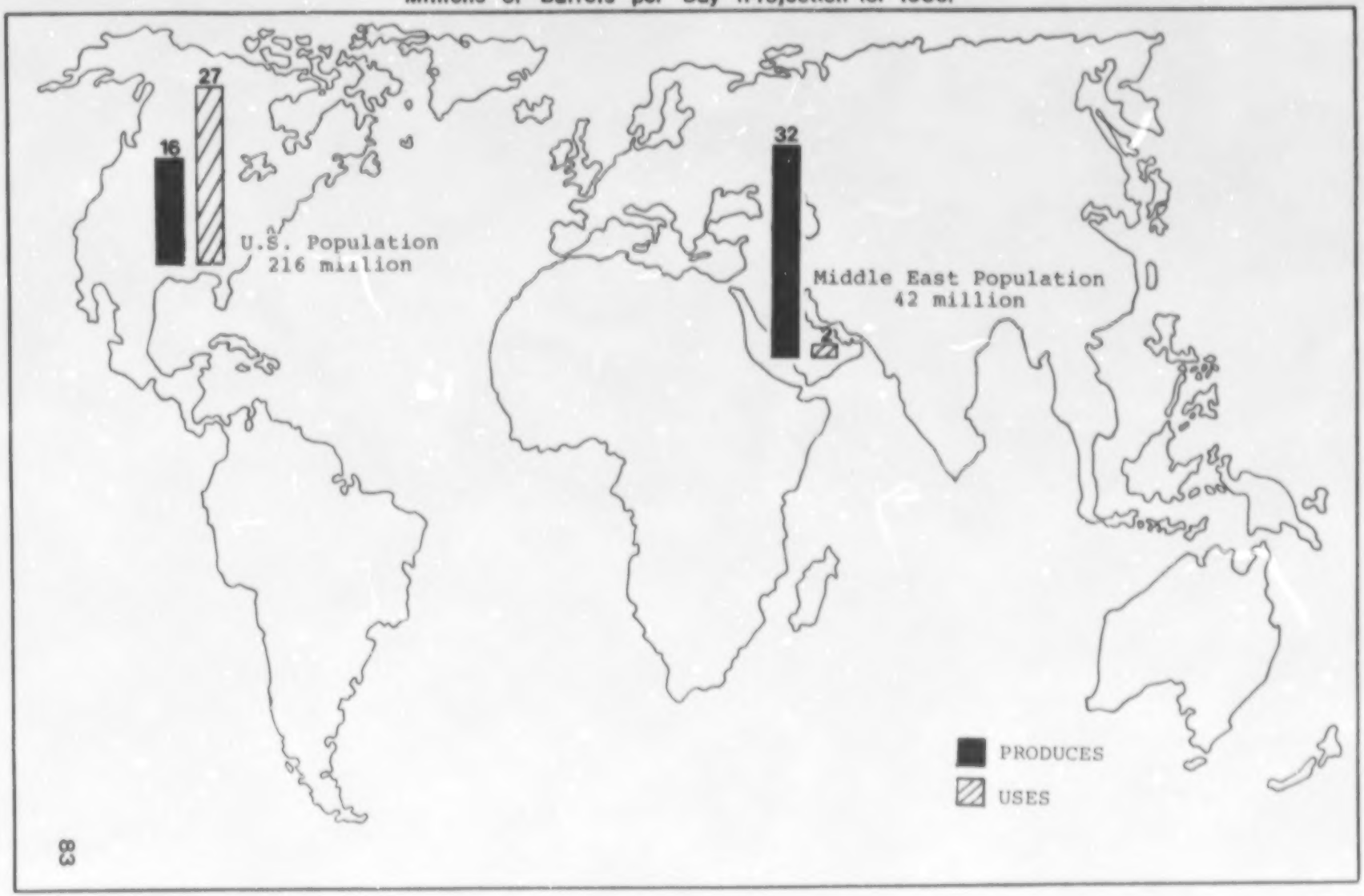
   b. Freeport, Louisiana is located _____ of Houston, Texas.

   north east south west

4. Kuwait is located on which gulf, the Gulf of Mexico or the Persian Gulf? _____

5. Which country is north of Kuwait? _____
   Which country is east of Kuwait? _____

Millions of Barrels per Day (Projection for 1980)



83

81

82

Lesson 5
Student Worksheet: Where Does Oil Stack Up?

Look at the map, Millions of Barrels per Day (Projection for 1980). Then answer the questions.

1. Does the United States produce as much oil as the Middle East?

2. Which uses more oil--the United States of the Middle East?

3. Which has more people--the United States or the Middle East?

4. Which probably uses all the oil it produces--the United States or Middle East?

5. Which probably cannot use all their oil?

6. If you had more of something than you could use, what would you probably do with the extra?

AHMED AND PETER

Peter looked at each seat on the bus to see if it was occupied, finally seeing one on the aisle near the back. He asked the youth on the seat next to it to move his raincoat so Peter could sit down. The boy smiled cheerfully and placed the raincoat on his lap, then he turned back to resume his study of the Texas cityscape. Peter sighed. He had hoped for some conversation; it made the time go more quickly. Then he took the conversational plunge.

"Want to talk?" he asked. "My name is Peter and I live here in Houston. Have lived here all my life. You're not from here, I bet."

The boy turned from the window and smiled. "My name is Ahmed and I live in Kuwait. Have you heard of it?" He asked the question almost hopefully.

"I think so," said Peter, trying to picture the world map hanging on the wall in Mrs. Perry's class. "Arabia somewhere?"

"Pretty close," said Ahmed. "It's a small country on the Persian Gulf. Do you know where that is?"

"I think so. It's hot there, isn't it?" asked Peter. "Is it as hot there in summer as it gets around here?"

"It's hotter in Kuwait, I think," said Ahmed. "Sometimes it gets up to 120°. Humidity is high too. Most of our offices, schools, and homes are air-conditioned. Have to be. We'd burn up otherwise, I think." He frowned briefly, then added, "It wasn't always that way. I remember my father talking about how they tried to keep cool on the awful hot days. Wasn't easy."

Peter hesitated a long moment before launching his next question. He didn't want to appear too nosy. "Are you here in Houston on a visit, or do you live here now? Permanently, I mean?"

"Just a visit. My father is here on business. He's in...well, he's in what everyone seems to be in, here in Texas. Oil."

Peter had heard of oil-rich countries in the Middle East. Heard everyone lived like he owned Park Place and Boardwalk on the Monopoly board. "Are you rich?" he asked, knowing it was rude to ask.

"Well, I will tell you that when my parents were young, they only brought in $21 a year." He smiled at Peter's blink of astonishment. "Of course, it is much higher now. The average yearly income of every man, women, and child in Kuwait is over $3,000. That's pretty good, I guess. My parents think so anyway." Ahmed waited a moment, thinking his next statement over carefully before saying it aloud. "We don't pay any taxes." He smiled at Peter's low whistle of surprise.

"No taxes? None at all?" Peter's thoughts ran back to the mutterings of his Dad at income tax time. *"Boy, would Pop like Kuwait."* Peter wondered if Ahmed's father had to pay for hospital care and for building schools for his kids, like his Dad did. His eye caught a glimpse of a highway sign outside the bus window. It was a large blue and white sign with a lot of dollar signs and numbers and the Governor's name. Large block letters said something about "YOUR TAXES AT WORK," and how much the new road was going to cost.

"Do people pay for roads in Kuwait?" he asked. Then he started to answer his own question, "No, I guess not, if you don't have to pay taxes. Who builds them then?"

"The government," said Ahmed. "The government pays for health care for everyone and education is free for kindergarten through college. The government pays for the airport, and even helped us get telephones." Ahmed smiled. "Now I bet you want to know where the government gets all the money, right?"

"The oil companies?"

"Right. We sell the most important thing we've got to sell -- oil. And the money goes toward making life better for everyone. It's even going for water, which is something we don't have very much of." He looked at Peter to see if he was still interested in hearing about Kuwait, and then continued, "You see, water is so scarce it used to be hauled in on teak wood boats from the Tigris River in Iraq. But now we get it from the fresh water plant. That's where they take the salt out of sea water and make it fresh and drinkable. I don't know how they do it exactly. It's pretty expensive, I heard."

"No water," thought Peter, beginning to change his mind about living in Kuwait. *"Still..."* His mind shifted gears. "How many people live in Kuwait, Ahmed?"

"About one million." He noticed Peter's raised eyebrows. "What's wrong?"

"Oh, nothing. I was just thinking. We have about two million people living in and around Houston itself, and that's just one city in all the United States. Hey, I just thought of something. We live on the Gulf of Mexico. And you live on the Persian Gulf. Get it? Both gulfs. And something else. We have oil in Houston, and you have oil in Kuwait. We have schools, hospitals, roads, TVs, telephones, airports...and you have these things too." Peter looked at Ahmed like a school buddy.

"And air-conditioning, Peter, don't forget the air-conditioning. All of Houston seems to be air-conditioned, from this bus to, well, that service station back there." He pointed to the filling station the bus had just passed.

"All the cars, too." Peter thought about the air-conditioning. And the heating, the cooking, the refrigerators. Everything seemed to take energy. To make things comfortable and fast, it took energy. It seemed that Houston, his city, would collapse without energy. "Where did all the electricity come from? What made the cars run?" Peter saw Ahmed looking at him and realized that he was talking out loud.

"Oil, Peter. Everything runs on oil."

"Your country, too. 'Cept you sell a lot of it, and we use a lot of it. Maybe we even buy it from you." Peter stopped talking at this new thought. "Do we?" I mean, do we buy oil from you?"

"Not so much here in Houston, Peter, but the rest of your country buys oil from our country. And from other Middle East countries. And Venezuela and Canada. You have to because there are so many machines here. I have never seen so many and so many different kinds. Wonderful machines. I'll tell you something else. These machines and factories of yours...well, not yours, exactly. But you know what I mean." Ahmed waited for Peter's nod. "Well, they make the things we need to buy for people in Kuwait."

"So, we help each other out in a way. It that what you mean?"

"Oil works both ways to help out." Both boys smiled at the partnership. And at their new friendship.

Lesson 5
Student Worksheet: About the Story:
Ahmed and Peter

Mark a T in the blank if the sentence is true.
Write an F if it is false.

_____1. Kuwait and Houston have hot summers.

_____2. Money from selling oil and gas help build hospitals in Kuwait.

_____3. Houston and Kuwait are on the same gulf.

_____4. Houston has more people and machines than Kuwait.

_____5. Kuwait sells some of its large supply of fresh water.

_____6. Salt water can be made into fresh water.

_____7. Ahmed receives free medicine and school books when he needs them.

_____8. People in Houston get many services by paying taxes.

_____9. Kuwait and Houston depend on oil to make life more comfortable.

_____10. Kuwait uses more oil than Houston.

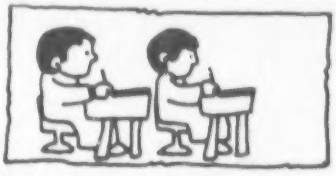
Lesson 5
Student Worksheet: HOW PEOPLE LIVE IN KUWAIT

In the 1970's the goods and services for people in Kuwait grew. Choose another country and compare its standard of living to Kuwait. Make your investigation into a report using the blocks on the next page for pictures or numbers. At the end of the report, list the books you used to get information.

Yearly income per person (after bills are paid)

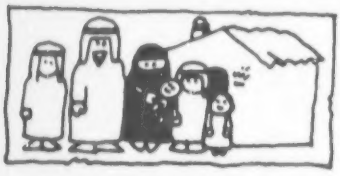
$3880

Percentage of population ages 6 to 19 in school



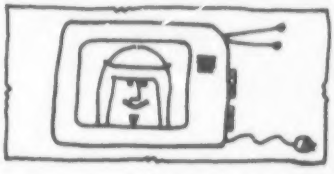
97%

Number of persons per household



6.1

Number of television sets per 1000 persons

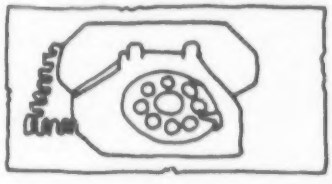


141

Physicians per person

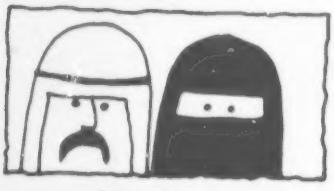
1 per 1070

Number of telephones per 100 persons



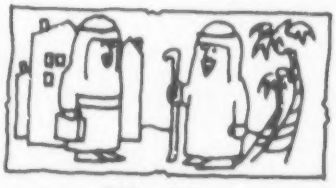
9.1

Life expectancy (years)
Male Female



64.4 64.4

Population residence
Urban Rural



80% 20%

HOW PEOPLE LIVE IN _____

Unit Test

TWO ENERGY GULFS

Choose the correct answer.

_____1. What is a gulf?

(a) a body of land surrounded by water on all sides.
(b) a wide inlet of the ocean.
(c) a very shallow stream of water.

_____2. Where are the two largest oil fields in the world?

(a) Southern California and the Rocky Mountains.
(b) Ural Mountains and Lake Maracaibo.
(c) Gulf of Mexico and the Persian Gulf.

_____3. Petroleum is formed over millions of years under great pressure and heat. It is formed from:

(a) plant and animal life.
(b) crushed rocks.
(c) petrified wood.

_____4. Why are the known oil reserves found near large bodies of water?

(a) glaciers slid across the earth leaving deposits of oil.
(b) volcanoes spilled out oil near the shorelines.
(c) plant and animal life lived there.

_____5. The movement of ocean water is called a:

(a) current.
(b) circuit.
(c) gulf.

_____6. Kuwait consumes:

(a) more oil than it produces.
(b) the same amount it produces.
(c) less oil than it produces.

Matching Test--Match Column A with Column B by placing the correct letter in front of the appropriate number.

Column A	Column B
_____7. Gulf of Mexico	A. largest oil producing area in the world
_____8. to get oil out of the ground	B. risks and dangers of oil drilling
_____9. Persian Gulf	C. oil that has been discovered but not extracted
_____10. 8 million barrels per day	D. off-shore drilling
_____11. fires, explosions, spills	E. a unit for measuring oil
_____12. consumption rate	F. usually extract with pumps
_____13. reserves	G. how fast oil is being used
_____14. barrels	H. oil production in the United States
_____15. pipeline	I. way of transporting oil from on-shore wells

True or False

_____16. The continents were once connected to each other.

_____17. A seismograph is one instrument used to find oil.

_____18. The Gulf of Mexico produces more oil than any other region in the world.

_____19. Kuwait is located on the Gulf of Mexico.

Choose the letter of the best source for each type of information. Put the letter in the blank.

A--graph B--flow chart C--case study

D--picture E--map

Which source of information would be best to:

____20. show how someone's life has changed.

____21. locate a gulf.

____22 show how oil is transported from well to refinery to consumer.

____23. show how much oil has been used in five years.

____24. show the size of a super tanker.

Optional Compare life in Kuwait with life in the United States. How has oil changed life in Kuwait? In the United States? How has oil changed education, medical services, goods, services, and recreation? Answer fully.

*U.S. GOVERNMENT PRINTING OFFICE : 1979 0-261-128/5